

A new stygobitic Calanoida (Crustacea: Copepoda) of the genus *Stygodiaptomus* Petkovski, 1981 from the Balkan Peninsula

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Abstract.—A new species of the genus *Stygodiaptomus* Petkovski, 1981 is described. The genus now includes three species, all endemic to the Balkan Peninsula: *S. kieferi* Petkovski, 1981, *S. petkovskii* Brancelj, 1991, and *S. ferus* n. sp. The male of *S. ferus* can be distinguished from males of the other species by the setation of swimming legs 1–4, and morphology of the exopodite and endopodite of leg 5. The diagnosis for the genus *Stygodiaptomus* is revised.

There are only a few true stygobitic species of calanoid copepods. Most reports of calanoid copepods from freshwater subterranean habitats are of one or a few specimens of epygean species, which are collected in subterranean habitats accidentally. Bowman (1986) cited only eight stygobitic freshwater calanoids of the world. In Europe, until now, five species have been described. Borutzky (1962) described *Speodiaptomus birsteini* from Crimea as a new species and new genus in a new subfamily, Speodiaptominae. Dussart (1970) described *Spelaeodiaptomus rouchi* from southern France as a new species and new genus in the recognized subfamily Diaptominae, and Kiefer (1978) redescribed the species. Three other stygobitic species of freshwater calanoids are known from the Dinaric Alps. Petkovski (1978) described *Troglodiaptomus sketi* as a new species and genus in the subfamily Speodiaptominae. Subsequently it has been recorded by Stoch (1984), Petkovski (1984), and Brancelj (1987, 1991) from other localities in the northern and central Dinaric Alps. Petkovski (1981) described *Stygodiaptomus kieferi* as a new species and new genus in the subfamily Diaptominae. Brancelj (1991) collected it again from the type locality in central the Dinaric Alps, and described *Stygodiapto-*

mus petkovskii as a new species from two caves in northern Dinaric Alps. During an investigation of the copepod fauna in Montenegro, one male specimen of a new species of the genus *Stygodiaptomus* was collected in Skadar Lake Valley (southern Dinaric Alps).

In the description, standard abbreviations of the characters are used as follows: A1, antennule; A2, antenna; Md, mandible; Mxp, maxilliped; P1–4, first to fourth swimming legs; P5, fifth leg.

Family Diaptomidae Baird, 1850
Subfamily Diaptominae Kiefer, 1932
Genus *Stygodiaptomus* Petkovski, 1981
Stygodiaptomus ferus, new species

Material examined.—One male (Holotype) from a small lake in the cave Sutimska Jama (42°25'50"N, 19°10'40"E), near the town Podgorica, Montenegro, coll. T. Karanovic, 18 Sep 1997. The specimen is completely dissected, mounted on a slide in Faure's medium, and deposited in the author's collection (No. 8/60/0584/c) at the Institute of Marine Biology, Kotor, Montenegro.

Description.—Male (Holotype): Length, including furcal rami (excluding furcal setae), 1.18 mm. Body colorless; without integumental windows, or paired sensila on

the lateral extensions of thoracic somite 6 or on the right side of the genital somite). Naupliar eye absent. Cephalothorax subcylindrical; about 1.4 times as long as wide, equaling 36.5% of body length (Fig. 9). Five thoracic somites of unequal width and length. Urosome cylindrical, 5-segmented, and dorsoventrally symmetrical (Fig. 10). Genital somite small. Caudal rami smooth, subcylindrical, and about 2.6 times longer than wide.

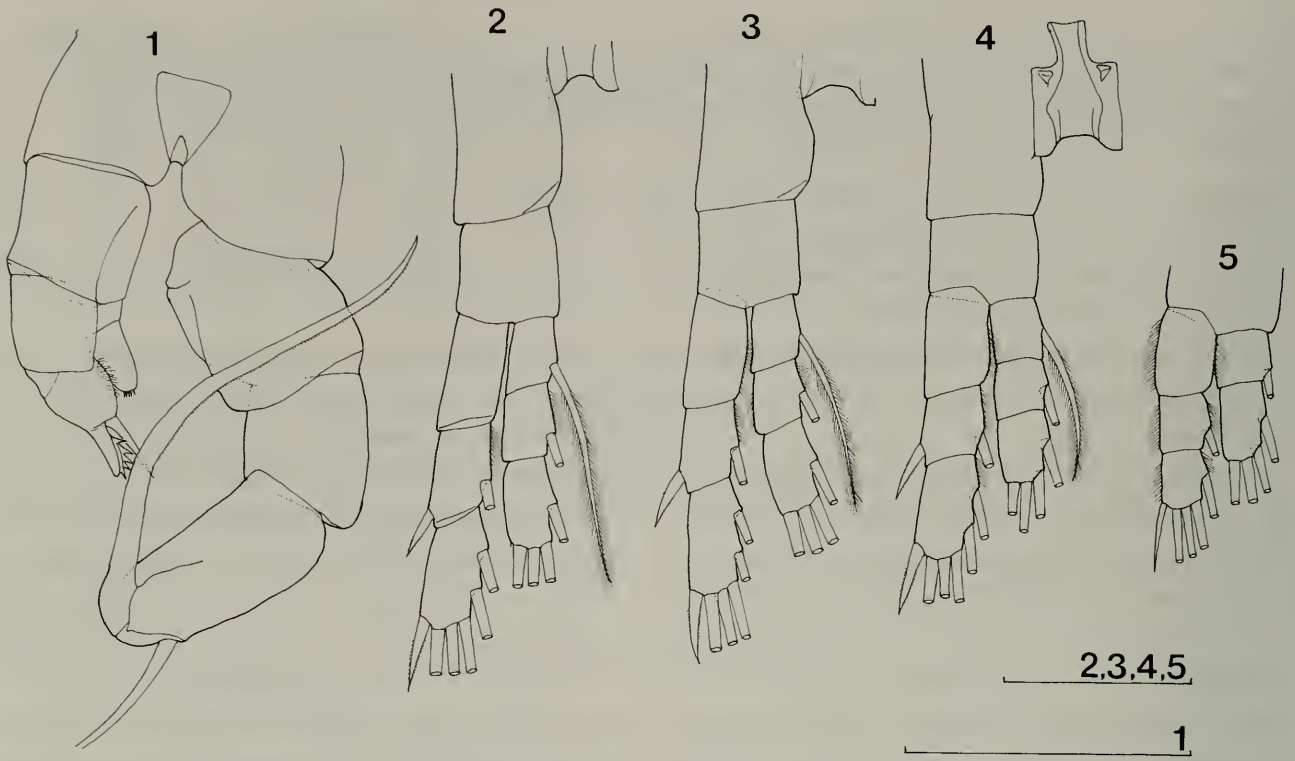
Left A1 25-segmented, reaching to middle of the furca, with cylindrical aesthetascs on articulating segments 1, 2, 3, 5, 9, 12, 14, and 19 (Fig. 12). Right A1 23-segmented (Figs. 6, 7, and 8), prehensile, with aesthetascs on articulating segments 1, 2, 4, 5, 7, 9, 12, 14, 18, and 23. Strong spines on segments 10, 11, and 13, as well as small ones on segments 7 and 12 (Fig. 6). Segments 15 and 16 with an attenuation on inner margin (Fig. 7). A2 with 2-segmented endopodite, and 7-segmented exopodite (Fig. 13). Md with 2-segmented endopodite, and 4-segmented exopodite (Fig. 14). Basis bears 4 setae; coxa with a sharp tooth separated from a number of small teeth. Maxillule and maxilla typical for the subfamily. Maxilliped slender, with 3 plumose setae on the basis, and 8 naked setae (2 long, and 6 small) on the coxa (Fig. 11).

All swimming legs without setae on the inner margin of the coxa. P1 with 3-segmented exopodite, and 2-segmented endopodite (Fig. 5). Exopodite of P1 with outer spine only on distal segment; first exopodite segment without inner seta. P2–4 almost identical (Figs. 2, 3, and 4); exopodite with outer spines on middle and distal segments; proximal segment unarmed. Middle endopodite segment of P2 without Schmeil's organ. Spine and setal formula on exopodite and endopodite of P1–P4 as follows (number to left of first slash refers to the inner spines or setae; number to right of second slash refers to the outer spines or setae; number between two slashes refers to the apical spines or setae):

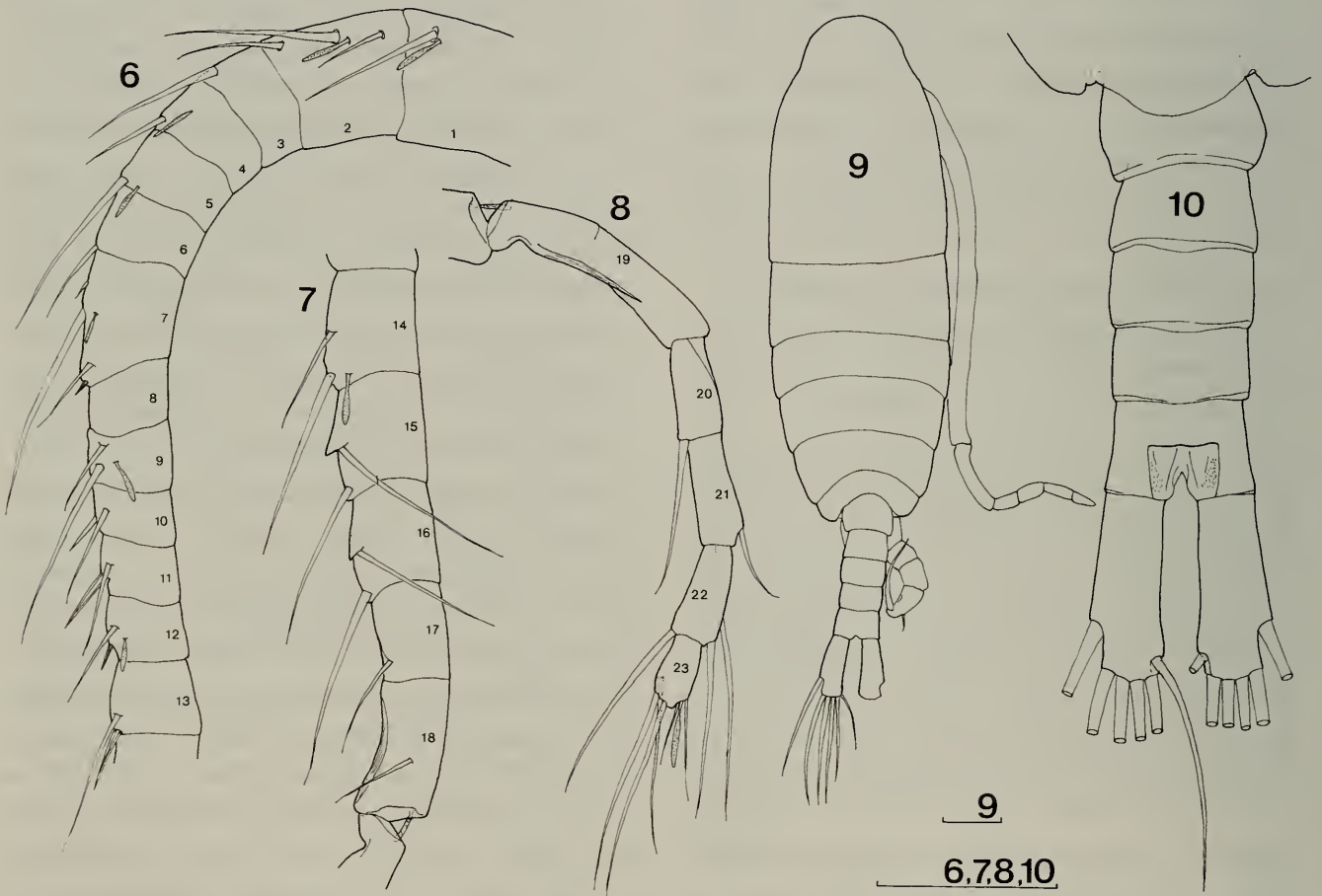
segments	exopodite			endopodite		
	1	2	3	1	2	3
P1	0/0	1/0	2/2/1	1/0	2/2/0	—
P2	0/0	1/1	2/2/2	1/0	1/0	2/2/0
P3	0/0	1/1	2/2/2	1/0	1/0	2/2/0
P4	0/0	1/1	2/2/2	1/0	1/0	2/2/0

Right P5 basis without hyaline membrane and almost as long as wide (Fig. 1). Proximal segment of exopodite as long as wide and with rounded distal-lateral corner. Distal segment of exopodite about 2 times longer than wide, with long lateral spine at 3/4th of its length, and a very long apical claw. Endopodite of right P5 undifferentiated. Left P5 with quadriform basis and 2-segmented rami. Distal exopodite segment bears 2 digitiform processes. The inner process is naked and longer than outer, while the outer one has 5 teeth on inner margin (Fig. 1).

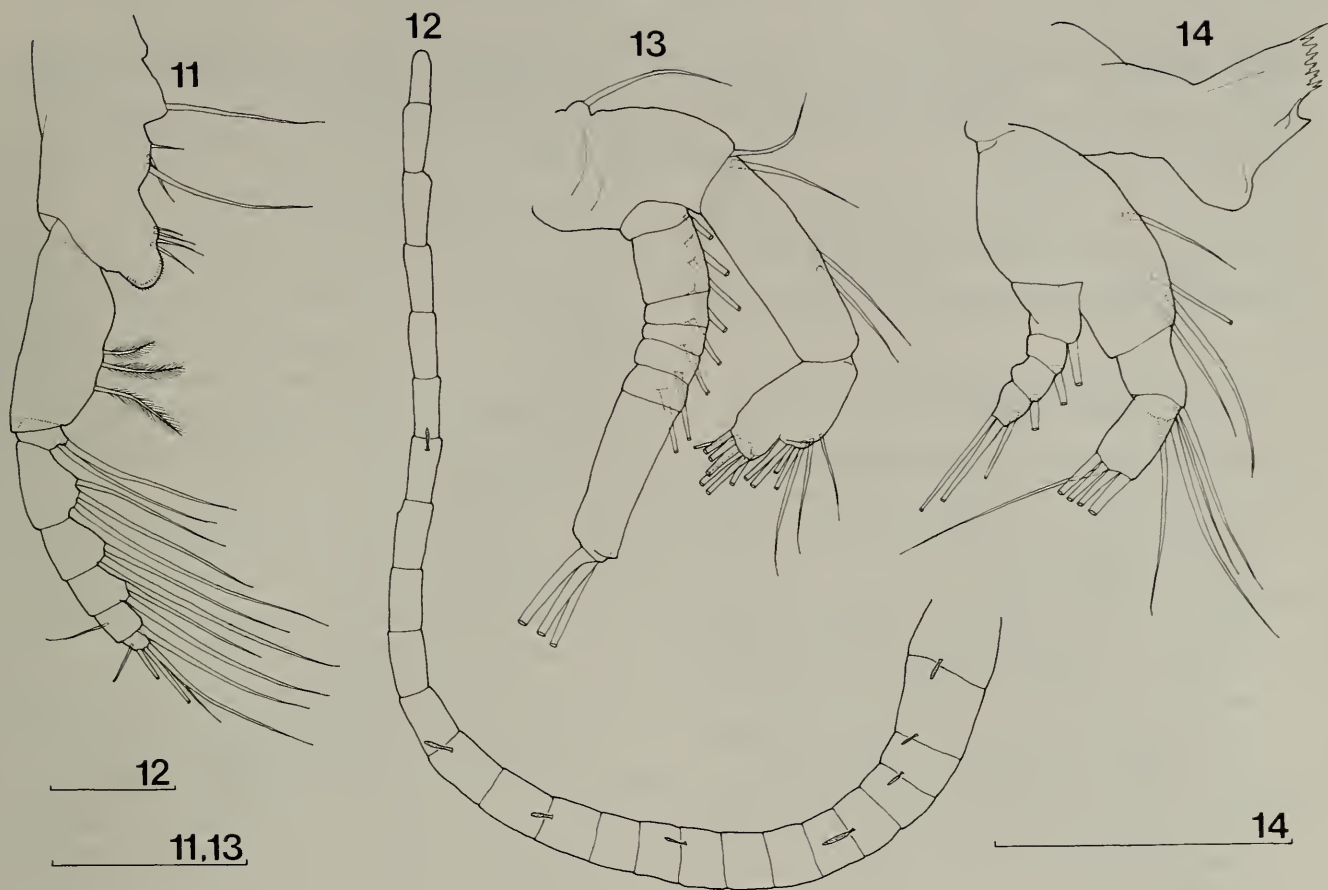
Remarks.—*Stygodiaptomus ferus* is clearly distinguished from the other two species in the genus *Stygodiaptomus* by the following: absence of armature elements on the first exopodite segment of P1–P4; presence of an outer spine on the second exopodite segment of P2; undifferentiated endopodite on male right P5; and basal segment of the exopodite on male right P5 with rounded distal-lateral corner. Other differences between *S. kieferi* Petkovski, 1981, and *S. ferus* n. sp. are: 2-segmented exopodite of P1 in *S. kieferi* (in *S. ferus* 3-segmented); inner margin of basis on male right P5 in *S. kieferi* with a strong spine (not developed in *S. ferus*); and completely fused 22nd and 23rd segments of the male right A1 in *S. kieferi* (not fused in *S. ferus*). *Stygodiaptomus ferus* n. sp. is more similar to *S. petkovskii* Brancelj, 1991; in addition to the differences noted above they differ only in details in armature of the male right A1, and male P5. A close relationship among these three species is suggested by the shape of male P5, A1, and identical armature of the P1–P4 endopodites.



Figs. 1-5. *Stygodiaptomus ferus*, n. sp., Holotype: 1, P5; 2, P4; 3, P3; 4, P2; 5, P1. Scale bars = 0.1 mm.



Figs. 6-10. *Stygodiaptomus ferus*, n. sp., Holotype: 6, right A1 (segments 1-13); 7, right A1 (segments 14-18); 8, right A1 (segments 19-23); 9, habitus, dorsal view; 10, abdomen, dorsal view. Scale bars = 0.1 mm.



Figs. 11–14. *Stygodiaptomus ferus*, n. sp., Holotype: 11, Mxp; 12, left A1; 13, A2; 14, Md. Scale bars = 0.1 mm.

Etymology.—The specific name is from the Latin adjective *ferus*, which means wild, agreeing in gender with the masculine generic name.

Geographic distribution.—The new species is known only from the type locality. We presume that it inhabits a wide area of Skadar Lake Valley in southeastern Montenegro and northwestern Albania.

Habitat notes.—Samples collected on two other occasions (3 Feb 1997, and 10 Aug 1998) from the type locality and earlier from more than 300 other localities in Montenegro did not yield additional specimens of the new species, or any other stygobitic calanoid. This suggests that either *S. ferus* is a very rare species, or that a cave environment is not the optimal habitat for it. We believe that its optimal habitat may be the large artesian reservoir which is located under Skadar Lake Valley. Unfortunately artesian waters have not yet been investigated in Montenegro.

Revised diagnosis for the genus Stygodiaptomus.—Diaptomids with 2- or 3-segmented endopodite of P1. Second segment of P2–P4 endopodites each with only 1 seta on the inner margin. Terminal segments on exopodites P2–P4 with 5 setae and 1 spine. Terminal segments of endopodites P2–P4 with 4 setae. All swimming legs without setae on the inner margin of the coxa. Male right P5 with 1-segmented, very small, or completely reduced endopodite. Male right A1 with short and strong spines on segments 10, 11, and 13, as well as a smaller one on 12th segment. This diagnosis separates the genus *Stygodiaptomus* from the most similar genus *Spelaeodiaptomus*, as well as from all other genera in the subfamily Diaptominae.

Key to the species of *Stygodiaptomus*

1. Right male P5 with smooth inner margin on basis 2

- Right male P5 with a strong spine on inner margin of basis
 *S. kieferi* Petkovski, 1981
2. First exopodite segment of P2–P4 with spine on outer margin
 *S. petkovskii* Brancelj, 1991
- First exopodite segment of P2–P4 without spine on outer margin . . . *S. ferus* n. sp.

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